

- 1 **Q: At page 74 Liberty notes, regarding bipolar or monopolar outages, that the**
2 **"general tendency is for a higher number of failures in the first couple of years**
3 **of operation, with the number then settling down to a lower level for may year,**
4 **until aging causes the number of failures to increase again." At page 18, Liberty**
5 **notes that a 50-year life has been specified for the LIL HVdc cables. Based on**
6 **Liberty's information and experience, what is the reasonable expected life, and**
7 **when is aging reasonably expected to begin to cause an increase in failures, for**
8 **each major component of the LIL and ML systems, e.g., cables, overhead line,**
9 **converter stations, electrode line and ground conductor.**
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- 12 **A.** The statement concerning the general tendency for failures of equipment describes
13 the well-known bathtub performance of electrical equipment, which is qualitative,
14 rather than quantitative. The actual ageing of equipment depends not only on the
15 design but also on the way it is used. There are many transformers in service which
16 are more than 50 years old. Generally, the control equipment is changed once or
17 twice in the life of an HVdc scheme. For the converter valves, some of the semi-
18 conductors will fail, perhaps a few each year, but the converter valves have in-built
19 redundancy, which means that these failures will not affect the operation or
20 performance of the HVdc scheme. For other equipment, asset management should
21 receive feedback from the condition monitoring at every maintenance outage, and
22 logging these trends and any failures will make it possible to judge when it may be
23 time to replace components of the HVdc scheme.